

Employment in waste management and recycling

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Report by Access Economics Pty Limited for

**The Department of the Environment,
Water, Heritage and the Arts**

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Glossary

ABS	Australian Bureau of Statistics
ACOR	Australian Council of Recyclers
DEWHA	Department of the Environment, Water, Heritage and the Arts
GDP	Gross domestic product
LGA	Local government authority
PC	Productivity Commission
WMAA	Waste Managers' Association of Australia
CAGR	Compound annual growth rate
NRI	National Recycling Initiative

Definitions

Collection	The consolidation, loading, transport and delivery of waste and recyclable materials.
Energy recovery	Energy recovered as a by-product of landfill or thermal treatment of waste-derived fuels.
Landfill	A site for the disposal of waste materials which have been collected and cannot be recycled.
Material transfer	The physical movement of material <i>within</i> or <i>between</i> organisations, separate from any transport involved in the initial waste collection and sorting process.
Material transformation	The process of transforming a material from a waste input into a different material/good that has economic value.
Recycling	Processing and transforming used materials into new products to reduce the consumption of fresh raw materials and reduce the amount of substances going to landfill.
Reuse	A form of recycling, where materials or products are used more than once without any transformation. The item can be used for the same function or a new function e.g. second hand clothing, building materials.
Sorting and recovery	Waste sorting for the purposes of eventual material recycling.
Waste input	Any material collected by (or on behalf of) an organisation that has been discarded or is no longer valued by its previous owner. This includes items that may eventually be recycled and reused.
Waste management	Management of the collection, recovery, transport, recycling, processing and disposal of waste.

Executive summary

Access Economics was engaged by the Department of the Environment, Water, Heritage and the Arts (DEWHA) to provide a report assessing the employment (direct and indirect) involved with waste minimisation, recycling and resource recovery, compared with landfill disposal of waste, through a qualitative and quantitative review.

This report does not assess the merits, or otherwise, of current state or federal government policies *per se* nor does it assess the relative economic merits of recycling versus landfill.

Given the incomplete and largely dated data sources currently available, Access Economics designed a survey for industry participants in order to obtain credible data on waste industry employment, the skill mixes involved and the economic value of those jobs.

The survey was sent to 344 industry participants in both the public and private sector, operating both landfill and a variety of recycling operations in all states and territories. Sixty-four responses were received, accounting for:

- 10.7 million tonnes of waste, or around 23% of total market waste;
- 6,211 full-time equivalent (FTE) employees (including outsourced labour), or roughly 23% of the total waste employment; and
- \$2.9 billion of turnover, or approximately 40% of total market turnover.

More responses were received from companies involved in recycling, and therefore the analysis presented for this sector is more robust.

The estimated direct FTE employment per 10,000 tonnes of waste is 9.2 for recycling and 2.8 for landfill. On a national level this corresponds to an estimated direct labour force of 22,243 FTEs in recycling activities and 6,695 FTEs in landfill operations, totalling 28,938 across Australia.

The higher FTE for recycling is due to the higher number of activities associated with the recycling process, and in particular the sorting, transfer and transformation of materials into new products, and the labour intensive nature of some of these processes compared with landfill-related employment.

A further 18,684 indirect jobs are estimated to be created through recycling activities and 5,624 through landfill. Direct and indirect jobs created through the waste industry in combination amount to 53,246. Employment covered a broad range of categories, the most predominant being: truck and forklift drivers; recycling and rubbish collectors; earth moving plant operators; factory process workers; and general and production managers.

The two major impediments to employment identified by respondents were:

- falling commodity prices (e.g. cardboard); and
- lack of government support, government levies and an uncertain regulatory environment.

Access Economics

1 Background

Access Economics was engaged by the Department of the Environment, Water, Heritage and the Arts (DEWHA) to undertake an analysis of the employment associated with waste, recycling and resource recovery markets, to complement the broader waste policy strategy work being undertaken by DEWHA.

The aim of the analysis was to determine the net employment (direct and indirect) benefit of waste minimisation, recycling and resource recovery, compared to landfill disposal of waste, through a qualitative and quantitative review. In addition to the development of credible data on landfill and non-landfill employment numbers, the economic value of those jobs, and the skill mixes involved have also been estimated.

This report does not assess the merits, or otherwise, of current state or federal government policies *per se* nor does it assess the relative economic merits of recycling versus landfill.

The assessment was undertaken in several stages, as outlined below.

- Firstly, the processes involved in waste management, and a series of definitions for the sector, were identified. This is detailed in Section 2 of the report.
- Secondly, desktop research was undertaken to establish the degree of information currently available, for use as a benchmark for Access Economics' own survey results. A summary of key data available is also presented in Section 2 of this report.
- Thirdly, a questionnaire was designed for industry participants to allow collation of up-to-date employment information. Details are set out in Section 4, while the survey itself is shown in Appendix A.
- Finally, Section 5 shows the survey results and provides conclusions about employment numbers, skills and value for the waste management industry in Australia.

2 Waste management practices in Australia

An important first step in the process was to define the stages of waste management processing in Australia. For the purposes of this report, waste is defined as any material collected by (or on behalf of) an organisation that has no further use or value to the previous owner in its current state and so has been discarded. Waste therefore includes items that may eventually be recycled and/or reused. So, in this report, the waste management industry includes the recycling and recovery industries.

Waste management practices typically vary between states and local government authorities (LGAs). Almost all Australian residences in urban areas have access to kerbside collection services for waste and recycling, as well as periodic hard waste collection, provided by LGAs. A majority of LGAs operate this service, although outsourcing to private companies is increasing.

Most LGAs also manage or outsource transfer stations, which sort landfill waste from recyclables, and landfill facilities. The quality and frequency of services provided, the types of bins and direct access to landfill facilities for excessive waste, varies between the LGAs.

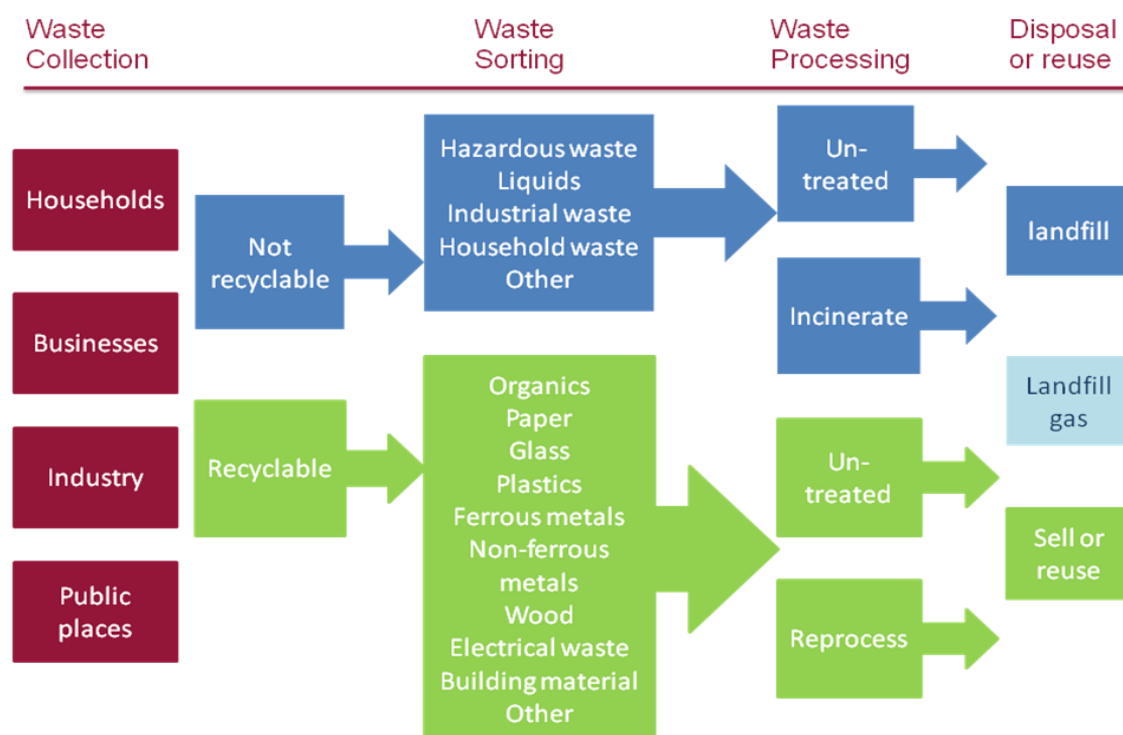
All states and territories in Australia aim to minimise their waste, and increase the percentage of waste that is recycled. This aim is typically enshrined in state legislation which may, for example, set specific landfill reduction targets, impose landfill material bans and levies, or direct product stewardship.

The four key areas of activity in the industry are:

- waste collection and transfer (typically managed by local councils);
- sorting of waste;
- recycling (i.e. manufacture of new goods) and reuse; and
- the final disposal of waste that cannot be recycled or reused into landfill.

This waste flow is shown in Figure 2.1 below.

Figure 2.1: Waste flows



Other considerations of this report include the source of waste and the various categories of waste.

Waste typically arises from three streams:

- **domestic and municipal** - includes all household waste and waste collected in public places;
- **commercial and industrial** - includes the waste from all business and industry activities and public institutions; and
- **construction and demolition** - includes all waste from the building and construction industry.

Categories of waste are potentially extensive. Waste industry participants – principally recyclers – with whom Access Economics consulted were helpful in deriving a sufficiently comprehensive list of categories on which to base survey questions. Waste products included in the survey are shown in Figure 2.1.

3 Economic data on the waste management industry

There is a substantial amount of published information on various parts of the waste management industry (and recycling in particular) throughout Australia. However, much of this data is disaggregated and/or dated. Nevertheless, when viewed as a whole, the data is useful for providing guidance on broad industry trends, and key industry statistics are therefore presented in this Section. In particular, reporting by the Productivity Commission (PC), ABS, and industry bodies (ACOR, WMAA) is cited. Notwithstanding the recent and rapid development of the recycling industry, the definitions for the sector used by these entities are consistent with that used by Access Economics.

3.1 Industry operators

The Australian waste management industry is comprised of private firms and government enterprises. Local Government is typically responsible for waste collection, transport and providing landfill facilities, although some of these activities are frequently becoming outsourced. Recycling is dominated by the private sector, and often forms just one part of a larger business. For example, metal manufacturers also tend to recycle scrap metal. Operating data for the sector is patchy, and the ABS advises caution in interpreting some of its data collected due to high standard errors of estimation. Key conclusions about the industry include:

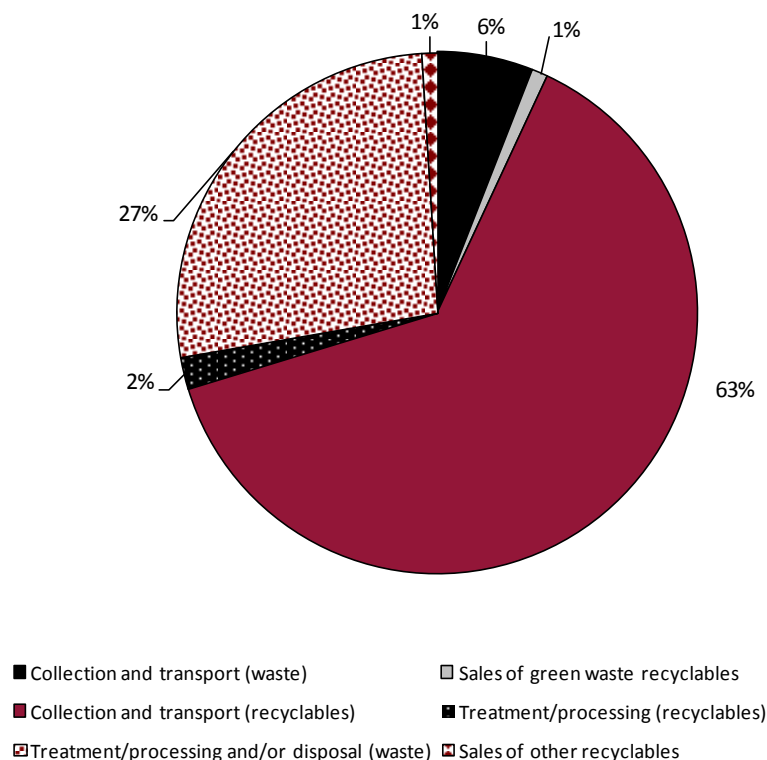
- The trading sector¹ dominates the industry, earning 90% of total industry revenue (Productivity Commission, 2006).
- As at June 2003, there were 1,092 businesses providing waste management services in Australia (ABS, 2004);
 - 74% of these employed four people or less.
- In 2001, the five largest companies – Cleanaway (now owned by Transpacific Industries Group), Visy Recycling, Collex (now owned by Veolia), Pacific Waste Management Australia (now SITA Australia) and Thiess Services – accounted for 42% of total market share (ABS, 2004).
- Income from sales and services in 2006-07 was \$6.9 billion (ABS, 2008).

It should be noted that the recycling sector has expanded and changed rapidly over the past decade, incorporating an increasing number of companies and materials used in recycling. The above data are therefore likely to be an under-estimation of current industry providers.

The Productivity Commission estimated the breakdown of revenue by key activity in the Australian waste management industry in 2002-03, based on ABS data, as shown in Chart 3.1. In 2002-03, waste collection and transportation was the largest component of the waste management industry, followed by the processing, treatment and/or disposal sector.

¹ The trading sector comprises private firms and government trading enterprises.

Chart 3.1: Revenue distribution in the Australian waste management industry, 2002-03



Source: Productivity Commission (2006).

3.2 Industry volumes

Table 3.1: Waste generation

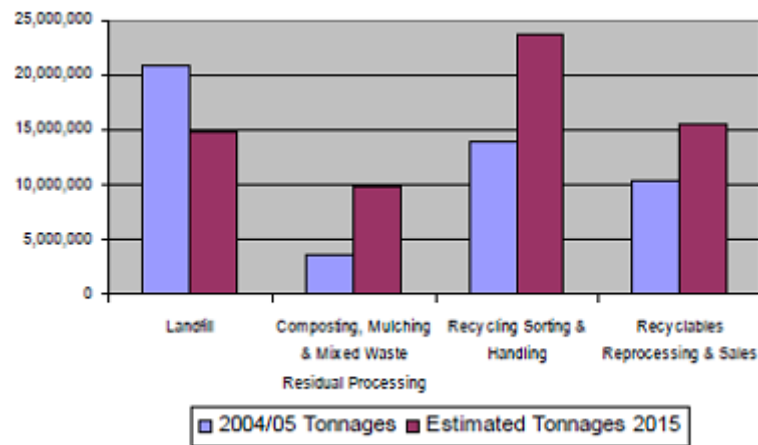
Waste Generation	1996-97	2002-03	2006-07
Total waste generated (tonnes)	22,748,500	32,382,000	41,399,550
Waste to landfill (tonnes)	21,220,500	17,423,000	20,909,925
Waste recycled (tonnes)	1,528,000	14,959,000	20,489,625
Percentage of total waste generated that is recycled	7%	46%	49%
Waste generation (tonnes per person)	1.23	1.62	1.97
Waste to landfill (tonnes per person)	1.15	0.87	0.995
Waste recycled (tonnes per person)	0.08	0.75	0.975

Source: ABS (2006) for 1996-97 and 2002-03 data; DEWHA (2008) for 2006-07 data.

The most recent year for which waste volume data has been collected by the ABS is 2002-03. Data for 2006-07 in Table 3.1 above is sourced from DEWHA and has been extrapolated from state collection data (excluding Tasmania and N.T. for which data is unavailable). Approximately 40 million tonnes of waste was generated in 2006-07, with an estimated 49% recycled. This represents a dramatic rise in recycled waste (29.6% CAGR) over the previous decade, although the rate of increase has slowed in more recent years (8.2% CAGR for the four years to 2006-07).

Chart 3.2 shows the distribution of waste to landfill, sorting facilities and recycling facilities in 2004-05, as well as estimates for 2014-15. Over 20 million tonnes of waste was sent to landfill in 2004-05 in Australia.

Chart 3.2: Waste and recycling by category (actual and projected tonnes)



Source: NRI (2009).

The Waste Management Association of Australia (WMAA) conducted a National Landfill Survey in 2009. It found that nearly 21 million tonnes of waste (more than 50% of total waste generated) was sent to more than 450 landfill sites currently operating across all Australian states (excluding the territories), as detailed in Table 3.2.

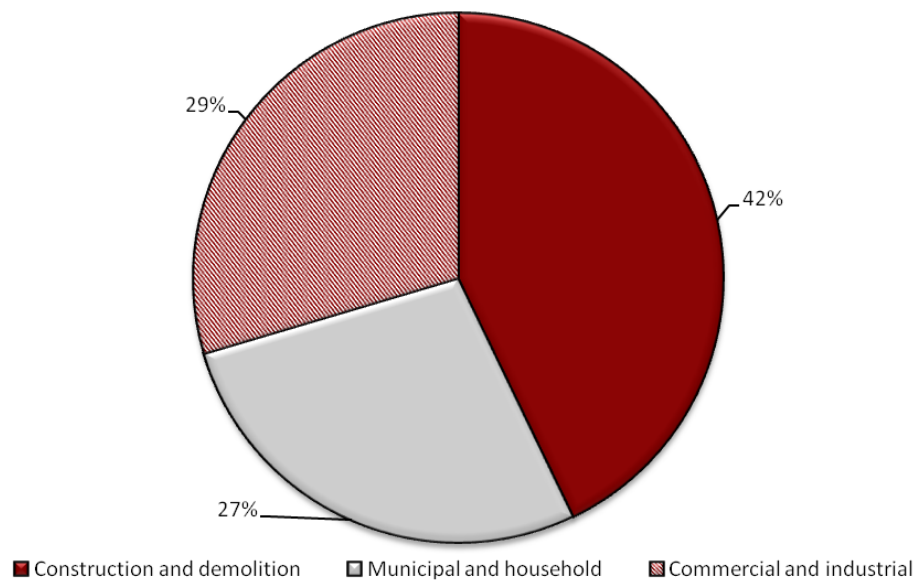
Table 3.2: Distribution of landfills and quantity of landfill waste

State/Territory	No. landfill sites	Tonnes of waste	% of recycling	% of total
SA	71	1,279,775	28	6.2%
WA	121	3,629,516	25	17.5%
VIC	56	4,989,813	55	24.0%
NSW	85	6,445,721	72	31.0%
QLD	97	4,013,470	45	19.3%
TAS	11	421,050	64	2.0%
ACT	1	N/A	N/A	N/A
NT	16	N/A	N/A	N/A
TOTAL	458	20,779,345		

Source: WMAA (2009).

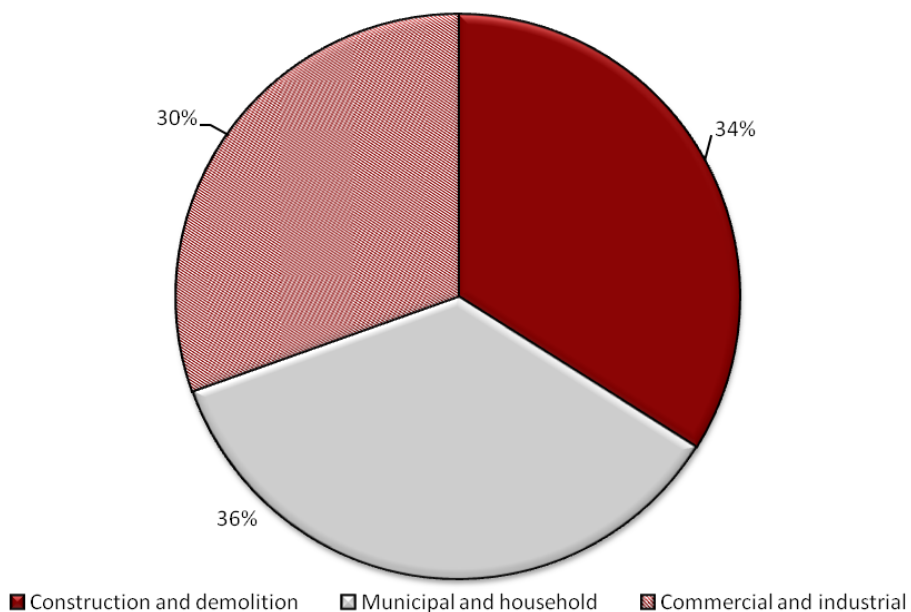
Waste from construction and demolition accounts for the largest source of total waste collected (Chart 3.3), with 40% of the total compared to 30% for municipal and household and commercial and industrial. However, as a source of input to landfill only, each of the three sources of waste was found to be roughly equal in size (Chart 3.4).

Chart 3.3: Sources of waste, 2002-03



Source: PC (2006)

Chart 3.4: Proportion of solid waste that is disposed to landfill, by waste stream, 2002-03



Source: ABS (2006).

Table 3.3 shows the percentage of each of the major categories of waste identified by the ABS generated from each waste stream. Organic waste makes up nearly half of all municipal and household waste, while concrete waste makes up over three quarters of all construction and demolition waste. "Other" waste includes hazardous waste, liquid waste and e-waste.

Table 3.3: The composition of solid waste generated by the three waste streams, 2002-03

Type of Waste	Municipal and household	Commercial and industrial	Construction and demolition
Organics (food and garden)	47%	13%	1%
Paper	23%	22%	-
Plastics	4%	6%	-
Glass	7%	2%	-
Metals	5%	22%	7%
Concrete	3%	3%	83%
Timber	1%	9%	4%
Other	12%	24%	6%

Source: ABS (2006).

Australians generated 1.97 tonnes of waste per capita (a total of 41,399,550 tonnes of waste) and recycled 49% of this waste. However, diversion rates vary quite significantly between states, as illustrated in Table 3.4.

Table 3.4: Per capita waste generation and diversion rates by state, 2006-07

State/Territory	Population	Disposed	Recycled Kg per capita	Total	Diversion rate
NSW	6,888,000	1,031	874	1,904	46%
VIC	5,205,000	754	1,222	1,976	62%
QLD	4,181,000	1,025	809	1,834	44%
WA	2,106,000	1,680	811	2,492	33%
SA	1,584,000	722	1,537	2,259	68%
ACT	340,000	581	1,668	2,249	74%
TAS	493,000		Unknown		Unknown
NT	215,000		Unknown		Unknown
Total	21,015,000	995	975	1,970	49%

Source: DEWHA (2008).

Note: NSW data is for 2004-05, WA landfill data has been extrapolated from municipal data

ACOR estimates of the make up of recycled materials in Australia in 2008 are shown in Table 3.5. Construction and demolition materials make up the largest component of recycled materials, accounting for more than 40% of the total, while paper/cardboard and ferrous metals make up the next two most significant sectors. Less than 5% of glass is recovered, which is low by international standards. According to the European Glass Container Federation (2009), recovery rates in 2007 were: 20% in the US, 57% in the UK, 87% in Germany and 95% in Switzerland.

Table 3.5: Recovery of Australian waste, 2008

Material Type	Amount recovered (T)	% of total
Paper/cardboard	2,645,349	21.8%
Glass	581,395	4.8%
Ferrous metals	3,488,372	28.8%
PET	348,837	2.9%
HDPE	27,848	0.2%
Concrete	41,564	0.3%
Mixed Construction & Demolition	5,000,000	41.2%

Source: ACOR (2008)

3.3 Employment data

National industry employment data is collected annually by the ABS, although the most recent data available is for 2006-07. Individual states and some industry bodies have also collected employment data for the sector on an ad hoc basis. Findings are presented in this section.

ABS provides employment data for the waste collection, treatment and disposal services industry in Australia from 1996-97 (Table 3.6). Data coverage includes the collection and haulage (excluding long distance) of domestic, commercial or industrial solid, liquid or other waste (except through sewerage systems), and the sorting, processing, treatment and disposal of waste.

Table 3.6: Employment in waste collection, treatment and disposal services

Year	Employment	annual growth
1996-97	9,107	
2002-03	14,386	7.9%
2004-05	26,617	36.0%
2005-06	26,492	-0.5%
2006-07	27,347	3.2%

Source: ABS (2008).

The South Australian container deposit scheme provides jobs for approximately 1,000 people. The Queensland Green Army is a \$57 million initiative aimed at delivering 2,300 six-month job placements to restore the environment and improve recycling and waste management. The Victorian Advanced Resource Recovery Initiative aims to establish eight new advanced resource recovery technology facilities across Melbourne, creating 250 permanent jobs, with an increase in indirect jobs also expected (Environmental Protection and Heritage Council, 2009).

“Incinerating 10,000 tonnes of waste creates one job; land-filling 10,000 tonnes of waste creates six jobs; and recycling 10,000 tonnes of waste creates 36 jobs”
Environment Victoria, 2009.

Table 3.7 shows the number of people employed in the Victorian recycling industry in 2004-05. Environment Victoria also estimated that 16,595 indirect jobs were created in Victoria as a result of the recycling industry in 2004-05. Environment Victoria estimates that increasing its recycling rate to 80% would create an additional 2,310 jobs.

Table 3.7: Recycling industry employment, Victoria, 2004-05

	No. people	% of total
Transportation/collection	1,850	28
Sorting	2,060	32
Reprocessing	2,620	40
	6,530	100

Source: Environment Victoria

This ratio of job type in Victorian recycling is likely to be similar for the Australian industry as a whole.

Table 3.8 shows the ratio of direct to indirect jobs in recycling sectors, based on data for the US state of Iowa. It should be stressed that these multipliers are based on several broad assumptions, and are not directly transferable to the Australian economy. However, in the absence of such local data, the Iowa figures provide a useful guideline for estimating the indirect employment associated with recycling. Plastics recycling had the highest downstream job impact of all commodities recycled with a multiplier of 2.53, implying that for every 100 jobs created directly, an additional 153 were created through supporting economic activity.

Table 3.8: Employment multipliers, by material

Commodity	Multiplier
Plastics	2.53
Aluminium	2.39
All other metals	2.48
Old corrugated containers	1.74
Glass	1.69
Wood	1.65
All other paper	1.64

Source: Iowa Department of Natural Resources

4 Survey design

Given the patchy and dated industry data available (as summarised in Section 3), Access Economics developed a questionnaire for members of the waste, recycling and resource recovery sectors. The survey aimed to collect data on:

- the total volume, type and source of waste collected;
- the activities carried out by the firm, (e.g. waste collection, sorting or transformation);
- the proportion of waste recycled, reused or sent to landfill;
- the number of people employed for each activity and key skill sets required; and
- impediments to employment.

The questionnaire is provided in Appendix A.

Access Economics consulted with several members of ACOR² regarding the survey contents to ensure questions would elicit clear and accurate information.

The Yellow and White pages were also used to source waste management companies. The survey was sent to a cross section of the industry, including private companies and local councils, who undertook waste collection, sorting, transformation, transfer or landfill activities. It was expected that some of the businesses would conduct more than one of these activities while others would specialise in one activity and outsource the rest.

Companies were predominately contacted by email with a link to a web-based survey³. Approximately 30% of these companies were first contacted directly so that surveys could be sent directly to the most appropriate person and so that contact details could be confirmed. Twenty per cent of surveys were sent by post to companies where an email address could not be found.

A total of 344 surveys were sent (cf 1,092 companies operational in 2003) on 28 and 29 May with a close date of 5 June, subsequently extended to 12 June to allow for slower postal returns.

² Access Economics attended the May ACOR member meeting to present the rationale behind, and to garner support for, the survey.

³ Survey designed using www.surveymonkey.com

5 Summary of survey responses

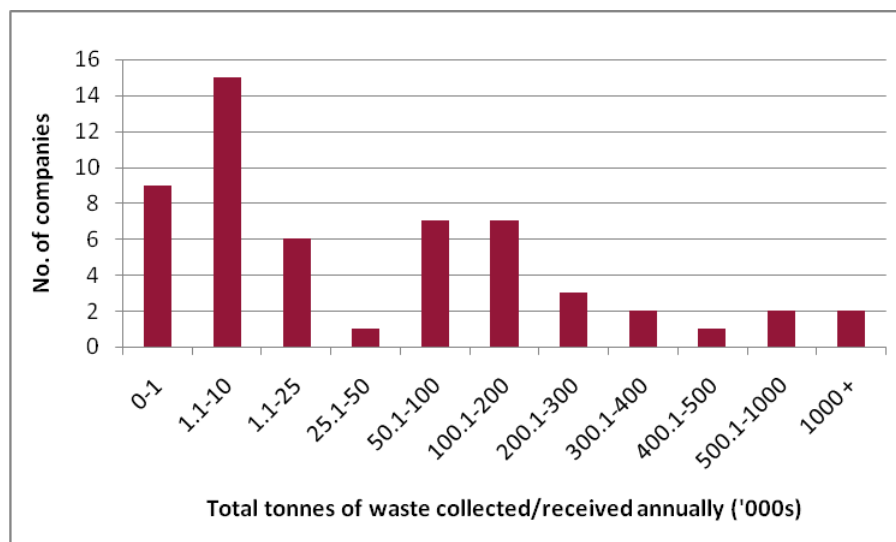
A total of 64 companies provided a (non-blank) response to the survey – via email, fax, web site and post – by close of survey, giving **a response rate of 18.6%**. A further six companies returned a blank response to the survey.

Aggregate survey responses are presented in this section, with interpretation of the results, including disaggregation by state, discussed in Section 6.

Question 1: Volume of waste

The volume of waste collected or received each year by the organisations surveyed ranged from as little as 10 tonnes per annum to as much as 3 million tonnes per annum (Chart 5.1). The average volume of waste collected or received each year is around 200,000 tonnes. **The total volume of waste collected by the companies surveyed was 10.68 million tonnes per annum.** Of the 64 companies that responded to the survey, 55 companies answered this question.

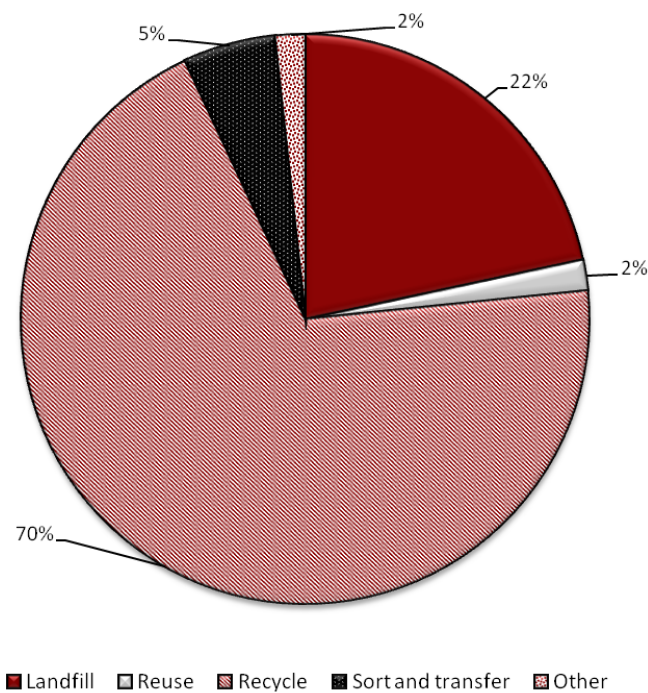
Chart 5.1: Annual tonnes of waste collected/received



Questions 2 - 4: Waste input and output

The companies surveyed were asked how waste input is processed (Chart 5.2). Seventy per cent of the waste input collected by respondent companies is recycled, while 22% is sent to landfill. Two per cent of the waste input is reused without any recycling processing and 5% of the waste input is sorted and transferred to other facilities, typically for further processing. These results reflect the stronger response rate from recyclers, and previously published data indicates a more even split of waste volumes between recycling and landfill.

Chart 5.2: Operations as a percentage of waste input



Of the 64 companies surveyed, 22 outsourced part or all of waste collection and transport. Nine of the companies outsourced some of their waste and recycling sorting, nine companies outsourced a component of their material transformation and recycling activities, 15 companies outsourced some of their material transfer and six companies outsourced a component of their general site and landfill management.

The contribution of construction and demolition waste to total waste input (Chart 5.3) is lower than could be expected from previous data (24%, cf expectations of around 40%), while the reverse is true for commercial and industrial waste (40% result, cf expectation of 30%). This variation is most likely a reflection of the sample size.

Material types collected (Chart 5.4) cannot be directly compared with other findings as the range of materials analysed are more detailed than those available from, for example, either the ABS or ACOR survey results. Nevertheless, the contribution from concrete and other construction materials appears significantly underweighted here which would be due to the low response rate from recyclers handling this material.

Chart 5.3: Waste streams as a proportion of total waste input

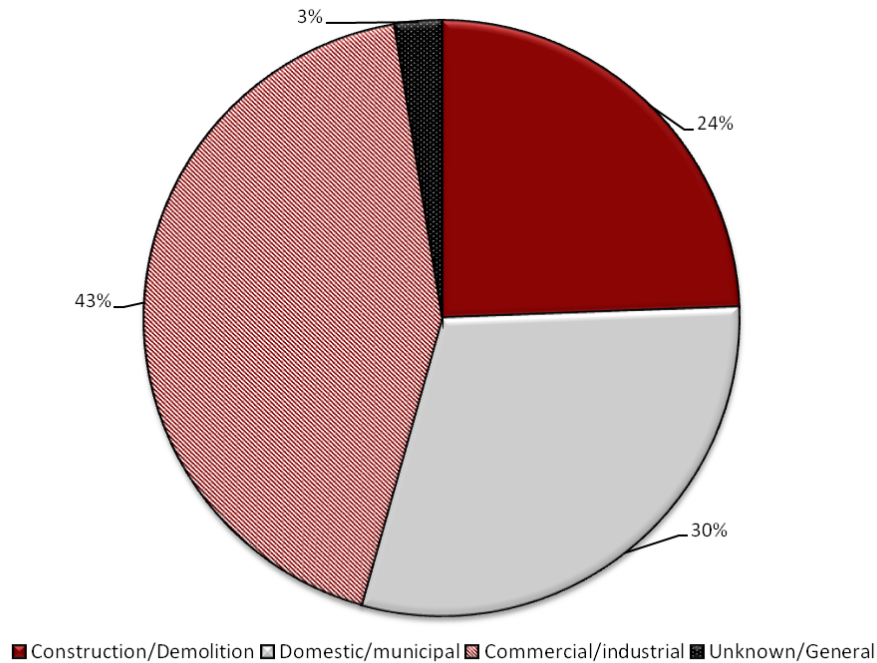
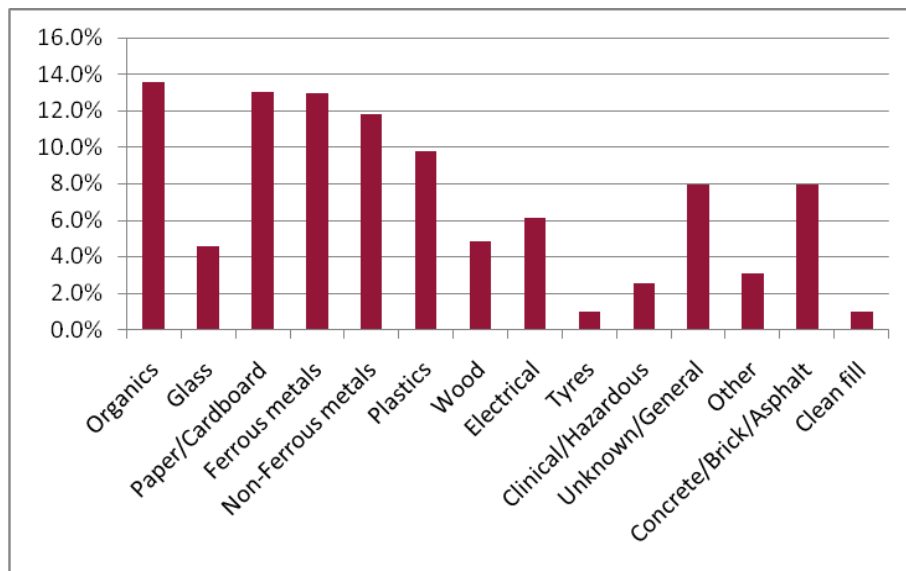


Chart 5.4: Waste material collected (% of total)



Questions 5 - 11: Employment and wages

For the 64 survey responses, the number of employees per company ranged from one to 1,000 (Chart 5.5). **The total number of employees (FTEs) of respondents was 4,198.**

Chart 5.5: Number of employees

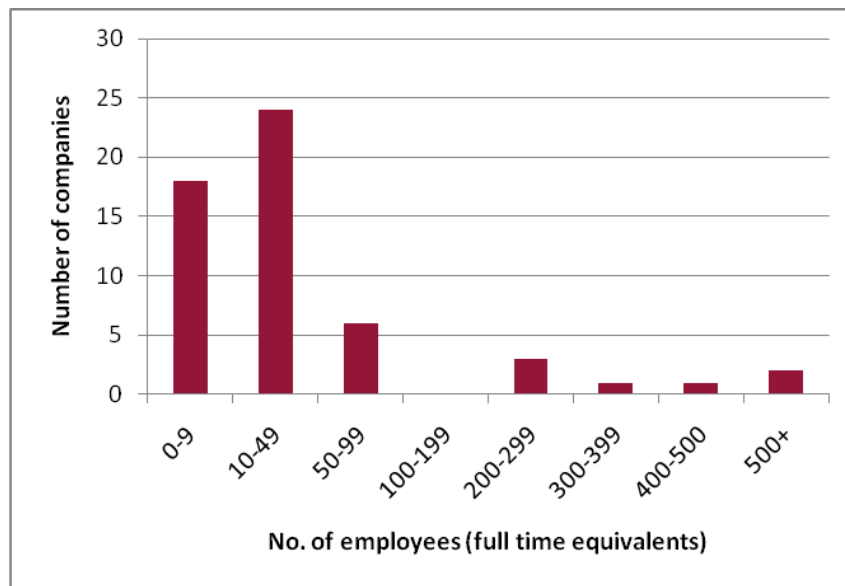
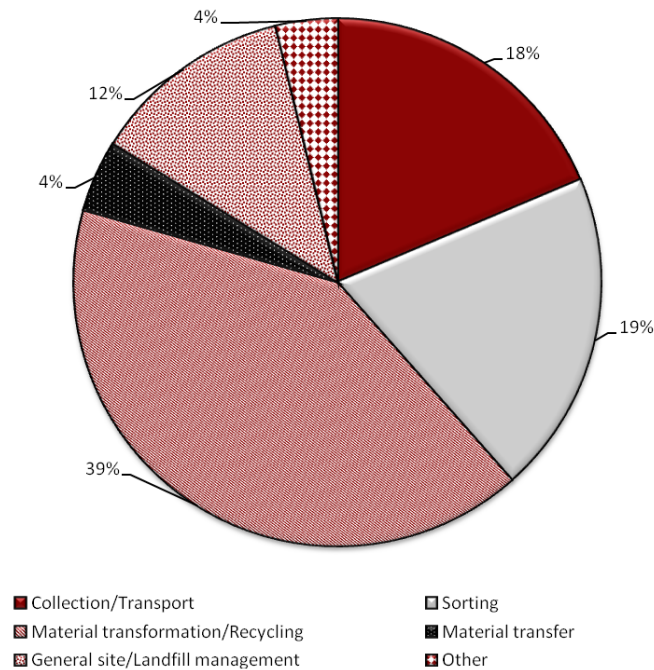


Chart 5.6 shows the number of people employed in each activity as a percentage of the total industry employment. Thirty-nine per cent of industry jobs are associated with material transformation and recycling activities, representing the single largest category of employment. Collection and transport, with 18% of employment, appears under represented. This is likely due to the particularly low number of responses received from Local Government Authorities which dominate waste collection.

Chart 5.6: FTEs, by activity (percent of total)

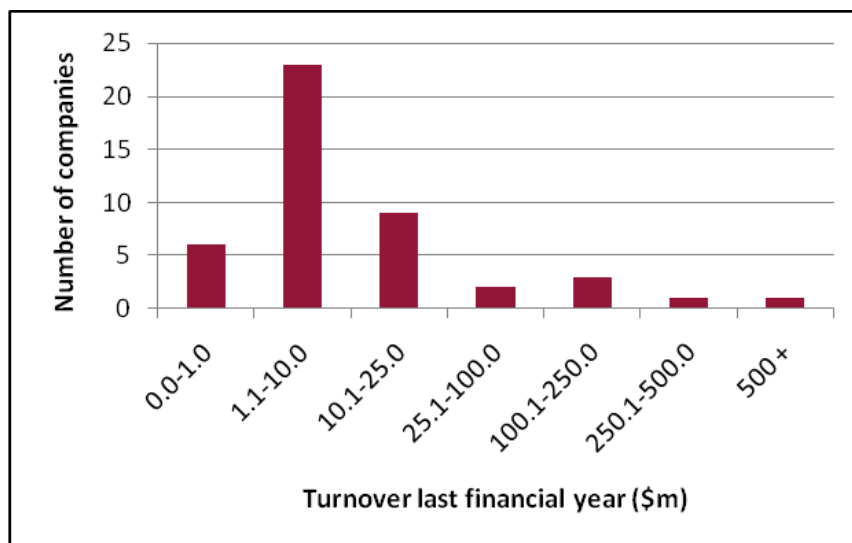


The average wage bill as a percentage of total operating costs is 31.9%, with a range of 5% to 70%. The higher figures typically came from organisations more heavily involved in recycling, reflecting the higher labour intensiveness of recycling activities.

Questions 12 - 13: Turnover

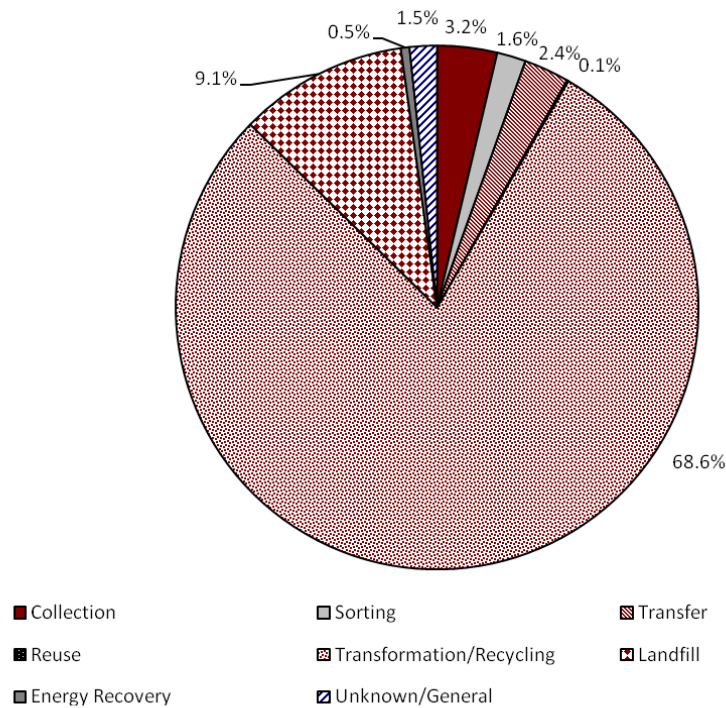
The annual turnover of respondents averaged \$64.6 million. The median turnover was \$6 million (Chart 5.7).

Chart 5.7: Turnover of companies surveyed



Of those surveyed, 68.6% of total income was derived from transformation and recycling activities, while 9.1% of income was associated with landfill activities (Chart 5.8).

Chart 5.8: Income from each activity as a percentage of total business turnover



6 Whole of industry inferences

Survey response coverage

The survey data collected by Access Economics aimed to provide an industry wide picture of waste industry activities and employment.

In total 64 (non-blank) responses were received, which together account for a total of:

- 10.7 million tonnes of waste or around 23% of total market waste;
- 6,211 FTE employees (including outsourced labour) or around 23% of the total waste employment;
- \$2.9 billion of turnover or around 40% of total market turnover; and
- approximately 6% of the total number of waste service providers (based on 2003 ABS estimates).

The higher proportion of total market waste volume, employment and turnover covered by survey respondents compared with the proportion of total number of waste service providers reflects the fact that, on average, the providers that responded to the survey included several of the largest companies in the industry.

However, responses received were more heavily weighted to companies involved in recycling, and therefore some results (e.g. average wages) may include some bias towards specific industry sectors. While 16 respondents (25%) indicated a volume of waste input sent to landfill of 55% or more, only eight respondents indicated a volume of 70% or higher, and just three companies indicated that 90% to 100% of input was sent to landfill. By comparison, 15 of the 64 responses received indicated that they recycled 90% to 100% of waste inputs. Confidence in results from landfill companies is therefore not as strong as that for the recycling sector.

The breakdown of responses by state is shown in Table 6.1.

Table 6.1: Survey response distribution

State	Count
NSW	24
VIC	11
QLD	10
SA	7
WA	11
TAS	1
ACT	0
NT	0

Employment

Survey participants were asked to provide the number of FTE employees, a proportion of total business employment by activity and a breakdown of total waste input collected and received.

The number of FTE employees per company surveyed ranged from one to 1,000. Based on survey results, the estimated direct FTE per 10,000 tonnes of waste is 9.2 for recycling and 2.8 for landfill. If this ratio were to hold at the national level, this implies an estimated direct labour force of 22,243 for recycling and 6,695 for landfill, totalling 28,938 for the industry across Australia.

The higher FTE for recycling is due to the higher number of activities associated with the recycling process, and in particular the sorting, transfer and transformation of materials into new products, and the labour intensive nature of some of these processes compared with landfill-related employment. Although landfill also includes the collection and transportation of waste to landfill sites, remaining landfill activities are less complex and labour intensive and as such have a lower FTE requirement.

Of the 15 respondents that recycled 90% or more of waste inputs, the survey indicated around one FTE was employed for every 4,200 tonnes of waste. In comparison, of the five respondents that sent 75% or more of waste inputs to landfill, the survey results showed around one FTE was employed per 10,000 tonnes of waste.

Table 6.2 below shows the implied labour force by state, based on survey responses on the number of FTEs and the estimated amount of waste recycled and disposed of in each state during 2008 (DEWHA, 2008). As waste volume data was not available for Tasmania or the Northern Territory, the estimated split between recycling and landfill has been set as the average of the remaining states.

The ratio of recycling to landfill labour is higher in South Australia, Victoria and the ACT than in other states, due to higher waste volume diversion rates (see Table 3.4) in those states.

Table 6.2: Direct employment, waste industry, 2008

State	Landfill	Recycling	Total	Ratio L:R	% of total
NSW	2,278	6,290	8,568	2.8x	29.6
VIC	1,259	6,645	7,904	5.3x	27.3
QLD	1,375	3,534	4,908	2.6x	17.0
WA	1,135	1,784	2,919	1.6x	10.1
SA	367	2,544	2,910	6.9x	10.1
ACT	63	593	656	9.4x	2.3
TAS	153	594	747	3.9x	2.6
NT	67	259	326	3.9x	1.1
National	6,695	22,243	28,938	3.3x	100

Survey respondents were also asked to identify impediments to employment. Twenty-one respondents identified impediments, the majority of which related to market conditions, although some identified skill shortages. The two major impediments identified were:

- falling commodity prices (e.g. cardboard); and
- lack of government support, government levies and an uncertain regulatory environment.

Illegal and unreported dumping sites, and on-site storage of waste, were also identified as industry issues that needed to be addressed.

Indirect employment as a result of recycling and landfill activities has been estimated using employment multipliers from the ABS Input-Output Tables 2004-05 and survey data. As the Input-Output tables do not contain a waste specific multiplier, an industry employment profile was developed using occupation and FTE employment data that was collected through the survey. The relevant employment sector multipliers were then selected to create a weighted average multiplier that reflected the make up of the waste industry. **Access Economics has estimated an indirect employment factor for the waste industry of 1.84.**

In total, a further 18,684 indirect jobs are estimated to be created through recycling activities and 5,624 through landfill. Direct and indirect jobs created through the waste industry in combination amount to 53,246.

Table 6.3: Indirect employment

State	Landfill	Recycling	Total
NSW	1,913	5,283	7,197
VIC	1,057	5,582	6,639
QLD	1,155	2,968	4,123
WA	953	1,499	2,452
SA	308	2,137	2,445
ACT	53	498	551
TAS	128	499	627
NT	56	218	274
National	5,624	18,684	24,308

Employment skills

Respondents were asked to identify key skills required for each stage of the waste process. Results are presented in Table 6.4 below.

Table 6.4: Top three occupations, by waste activity

Waste Activity	1	2	3
Waste/Recycling Collection	Truck Drivers	Recycling and Rubbish collectors	General managers
Waste/Recycling Sorting	Other Factory Process Workers	Production Managers	Other
Material Transformation	Other Factory Process Workers	Earthmoving Plant Operators	Other Miscellaneous Technicians and Trades Workers
Material Transfer	Truck Drivers	Supply and Distribution Managers	Forklift Drivers
General site/Landfill management	General Managers	Earthmoving Plant Operators	General Clerks

Source: Access Economics

There was no consistent response regarding skill shortages across respondents. Shortages identified were:

- qualified extruder operators;
- mobile operators;
- quality operators of earth moving equipment and semi tipper operators;
- demolition contractors;
- plant operators in general;
- supervisors / leading hands in general site management;
- truck drivers (two responses); and
- technical knowledge in plastics.

Turnover

Of the 64 survey responses received, 45 supplied information on annual turnover giving a total of \$2.9 billion, or an average annual turnover per company of \$64 million.

Two of the survey responses accounted for around \$2 billion or 70% of the total annual turnover of combined responses. The remaining companies that participated in the survey indicated annual turnover ranging from \$100,000 to \$250 million. Excluding the two largest companies that participated in the survey, the calculations give an average annual turnover of around \$21 million for the remaining companies. The high average annual turnover may be due to survey responses being received from predominantly larger waste companies.

The annual turnover of recycling activities is estimated at around \$530 per tonne, which is predominantly due to the transformation and recycling of waste. This compares favourably with landfill activities which has an estimated annual turnover of around \$73 per tonne. The significant variation between the two classes of waste can be attributed to the more labour intensive nature of the manufacturing of recycled products, as can be seen in the FTE employment figures discussed above, and the higher end value of recycled products compared with landfill waste.

Wages

Survey participants were asked to provide the percentage share of operating expenses that could be attributed to wages. Wage information was received from 43 survey respondents, with wages as a share of operating expenses ranging from 5% to 70%. The wage bill for the 43 responses totalled \$566 million, resulting in an average wage per FTE employee of \$111,000.

The average wage which results from the survey data is higher than previous estimates by the ABS. This outcome may be the result of two factors:

- the higher response rate from recyclers, for which the average wage is 37% higher (\$112,000 compared with \$82,000); and/or
- the inclusion of wages paid to outsourced activities, which would increase the wage bill as a proportion of operating expenses. (Access Economics is unable to determine if this portion of operating costs has been included as a wage expense.)

Access Economics has used the ABS data⁴ to estimate an average wage for the waste industry. Based on the ABS total cash earnings data, and using the industry employment profile which Access Economics used to derive the indirect employment estimates (constructed from survey responses), the average wage for the waste industry is estimated at approximately \$67,000.

⁴ 6306002a, Employee Earnings and Hours, Australia, August 2008 (cat. no. 6306.0)

Conclusions

Survey results

Access Economics' survey of the waste industry received a strong overall response rate from industry participants by volume of waste (23%), by employment (23%) and by turnover (40%) measures. The results were also broadly consistent with previous research findings for the sector.

However, as noted in Section 6 above, the response rate to Access Economics' survey was greater in the recycling sector.

Response rates may have been (adversely) affected by other, concurrent sector surveys as well as regular reporting requirements from several state governments (in particular NSW and Victoria).

Consequently, confidence in results from landfill companies is therefore not as strong as that for the recycling sector, and some survey results (e.g. average wages) may therefore include a degree of bias towards specific industry sectors.

Greater confidence in landfill responses could be gained by re-running this survey with the participation of industry representative bodies and a greater survey response time allowed.

Employment results

The results of Access Economics' survey indicate that waste industry direct employment currently totals just under 29,000 FTEs, of which a little over 22,200 FTE positions (77%) are in recycling businesses compared with approximately 6,700 FTEs in landfill operations. An additional 24,300 indirect FTE positions are estimated to be created by the sector.

Assuming both total waste and the share of total waste diverted to recycling continue to grow at similar rates to those demonstrated in recent years (as discussed in Section 3.2), the volume of waste generated would increase to more than 63 million tonnes and the average national diversion rate would reach 56% by 2014-15. Assuming that the FTE per 10,000 tonnes for each category continued to hold over the next five years (9.2 for recycling, 2.8 for landfill), and that the indirect multiplier remained at 1.84, then direct employment in the sector would increase to 42,170 FTEs (34,240 in recycling) and indirect employment of 35,420 FTEs (28,760 from recycling activities).

In addition to extended sector surveying, an assessment of current and future industry trends could benefit from:

- a more detailed derivation of an industry multiplier, through CGE modelling; and
- a better understanding of the potential impact of "learning by doing" on recycling sector productivity trends.

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Appendix A: Survey

Q 1.

What is the total volume of waste collected/received by your organisation each year (tonnes)? Note that waste input includes items that may eventually be recycled and reused. An approximation is encouraged if a precise answer is unknown.

_____tonnes per year

If the answer to this question is zero, there is no need for you to complete further questions in this survey. Please return the form as it is.

Q2.

As a percentage of this waste input, what percentage (to the nearest 5%):

[NB. Please provide an approximation, even if precise answers are unknown.]

Goes to landfill? _____%

Is reused? _____%

Is recycled? _____%

Other _____% (please specify)_____

Q3.

As a proportion of the total volume of your waste input, please specify the source of this waste as a percentage (to the nearest 5%) of total waste.

[NB. Please provide an approximation, even if precise answers are unknown.]

Domestic/municipal _____%

Commercial/industrial _____%

Construction/demolition _____%

Unknown/general _____%

Q4.

As a percentage of the total volume of your waste input (to the nearest 5%), please specify the type of waste collected.

[NB. Please provide an approximation, even if precise answers are unknown.]

Organics	_____	%
Concrete, brick, asphalt	_____	%
Clean fill	_____	%
Glass	_____	%
Paper	_____	%
Ferrous metals	_____	%
Non-Ferrous metal	_____	%
Plastics	_____	%
Wood	_____	%
Tyres	_____	%
Electrical	_____	%
Hazardous waste	_____	%
Unknown/general	_____	%
Other	_____	% (please specify)_____

Q 5.

What is your total employment (Full Time Equivalents)? _____

Q6(a).

As a proportion of your total business employment, what percentages of jobs (to the nearest 5%) are associated with each of the following activities?

[NB. Please provide an approximation, even if precise answers are unknown.]

Waste collection	_____%	
Waste sorting	_____%	
Material transformation	_____%	
Material transfer	_____%	
General site/ Landfill management	_____%	
Other	_____%	(please specify) _____

Q6(b).

Do you outsource activities related to the above activities? If yes, please identify the proportion of that activity that is outsourced (to the nearest 5%) as a % of the total volume of material involved in your activity.

Activity	Outsourced?	%age outsourced
Waste collection	Yes / No	(if yes) _____%
Waste sorting	Yes / No	(if yes) _____%
Material transformation	Yes / No	(if yes) _____%
Material transfer	Yes / No	(if yes) _____%
General site/ Landfill management	Yes / No	(if yes) _____%
Other (please specify) _____	Yes / No	(if yes) _____%

Q7. For each of the activities specified in the columns below, please identify the top three occupations from the lists provided (using 1, 2 and 3 in the corresponding boxes) that are required to perform each function.

Occupations	Collection	Sorting	Material Transformati	Material transfer	General site/landfill management
Management/clerical					
General Managers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research and Development Managers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engineering Managers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Production Managers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supply and Distribution Managers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Clerical and Office Support Workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engineers					
Chemical and Materials Engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrical Engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electronics Engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Industrial, Mechanical and Production Engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Engineering Professionals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Science professionals					
Chemists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Natural and Physical Science Professionals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Science Technicians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Draftspersons and technicians					
Electrical Engineering Draftspersons and Technicians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mechanical Engineering Draftspersons and Technicians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Building and Engineering Technicians	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Trades Workers					
Metal Casting, Forging and Finishing Trades Workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sheetmetal Trades Workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Structural Steel and Welding Trades Workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metal Fitters and Machinists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemical, Gas, Petroleum and Power Generation Plant Operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Miscellaneous Technicians and Trades Workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Clerical and Office Support Workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Clay, Concrete, Glass and Stone Processing Machine Operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metal Engineering Process Workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plastics and Rubber Factory Workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Timber and Wood Process Workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Factory Process Workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Machine Operators					
Paper and Wood Processing Machine Operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plastics and Rubber Production Machine Operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Machine Operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Crane, Hoist and Lift Operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engineering Production Systems Workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Stationary Plant Operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Earthmoving Plant Operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forklift Drivers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Mobile Plant Operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drivers/other					
Delivery Drivers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Truck Drivers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recycling and Rubbish Collectors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (Please Specify) _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q 8.					
<p>Please identify any other occupations required in the waste collection, sorting or recycling activities of your organisation that are not identified above.</p> <p>_____</p> <p>_____</p>					
Q9.					
<p>Are there any shortages for any of the occupations you have identified? If so, please specify the occupations (using categories provided for Q7).</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p>					

Q 10.
Can you identify any other impediments to greater employment in your business? If so, please describe them.
Q 11.
What is your wage bill as a proportion of total operating costs? _____%
Q 12.
What is your total annual turnover for the last financial year (A\$)? Please provide an approximation if unable to provide a precise answer. \$ _____
Q13.
As a proportion of your total business turnover (as specified in Q12 above), where does your income come from each of the following activities (to nearest 5%)? Approximations are encouraged if precise answers are unknown.
Landfill _____%
Reuse _____%
Recycling _____%
Energy recovery _____%
Unknown/general _____%
Q 14.
Please use this space to make any additional comments you feel are relevant.
Q 15.
Are you happy to be contacted by Access Economics for a brief phone call to elaborate on any of these answers?
Yes / No
If yes, please provide your contact name and number you can be reached on.
Name _____ Number _____
